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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/587,895

07/28/2006

Shu Kobayashi

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38834

7590

04/28/2009

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP  
1250 CONNECTICUT AVENUE, NW  
SUITE 700  
WASHINGTON, DC 20036

EXAMINER

ROBINSON, RENEE E

ART UNIT

PAPER NUMBER

1797

MAIL DATE

DELIVERY MODE

04/28/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/587,895	<b>Applicant(s)</b> KOBAYASHI ET AL.	
	<b>Examiner</b> RENEE ROBINSON	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1, 3-8 and 10-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,10-13,15 and 17 is/are rejected.
- 7) ☒ Claim(s) 14 and 16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 July 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                      |                                                                   |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____                                                          | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

1. Amendment to claims 1, 8 and 13 and submission of an English translation of the foreign priority document filed on 11 February 2009 are noted.
2. Objection of claim 13 is withdrawn.
3. Rejection of claims 1, 3-8 and 10-17 under 35 U.S.C. 112, second paragraph, is withdrawn.
4. The English translation of the foreign priority document is sufficient to overcome the rejections based on the Remy (US 2005/0170142) and Kobayoshi et al ("A Microfluidic Device for Conducting Gas-Liquid-Solid Hydrogenation Reactions") references. Rejection of claims 1, 3-8 and 10-17 under 35 U.S.C. 103(a) is withdrawn. New rejection follows.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**8. Claims 1, 7, 8, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harston et al (WO 99/22857) in view of Anderson et al (US 2004/0028804).**

9. Regarding claims 1, 7, 8, 15 and 17, Harston discloses a method of catalytic reaction using a micro-reactor (p. 1, lines 20-24). The method is characterized in that:

- the method of catalytic reaction uses a micro-reactor with a catalyst as a solid phase (film) supported on the inner wall of a channel (p. 4, lines 16-19);
- a gas as a gas phase is passed at the center part of the channel (p. 7, lines 8-10; Fig. 5);

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10. Harston discloses that a second fluid (a liquid phase in which the reactant is dissolved) passes down the walls of the channel, while the other fluid (gas) is maintained at the center of the channel (p. 7, lines 8-10). Therefore, in the embodiment with a supported catalyst on the wall, the reaction is inherently conducted by a three phase catalytic reaction of solid-liquid-gas phases accelerated by the catalyst. Harston further discloses carrying out hydrogenation reactions in the micro-reactor, in which an organic liquid is contacted with a flow of hydrogen gas (page 6, lines 24-26).

11. Harston does not expressly disclose:

- a metal catalyst or metal complex catalyst incorporated in a polymer;
- a catalyst incorporated in a polymer which is supported on the inner wall of the channel by covalent bonds to a group provided on the inner wall of the channel or the catalyst incorporated in a polymer is supported on the inner wall of the channel by covalent bonds via a spacer bonded to a group of the polymer surface.

12. Anderson discloses a method of preparing microarrays of polymer elements, which are applicable for the production of microreactors (Abstract; p. 9, par. 0068). The microreactor comprises a base substrate and a polymer element deposited on the substrate surface (p. 1, par. 0008). The substrate surface is analogous to the claimed channel wall. Anderson further discloses that the microreactor may contain a buffer layer between the polymer and the substrate surface, which is analogous to the claimed spacer (p. 2, par. 0022). The polymer elements are bound to the substrate surface or buffer by covalent interactions (p. 1, par. 0008; p. 2, par. 0022). Anderson teaches

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functionalizing the polymer element with an epoxide group, as well as choosing the composition of the buffer layer (spacer) to enhance its interaction with the polymer element and the substrate surface (p. 2, par. 0002; p. 5, par. 0040). Therefore, the epoxide groups would inherently be involved in the covalent interactions between the polymer element and the buffer layer. Anderson teaches that the covalent bonding interactions maximizes adherence of the polymer element to the substrate surface (p. 2, par. 0021). Anderson further discloses that a metal ligand (such as platinum) may be immobilized to the polymer element and used as a catalyst (p. 5, par. 0039; p. 8, par. 0064).

13. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the process as disclosed by Harston by using a microreactor with a metal catalyst immobilized (incorporated) in a polymer, wherein the polymer is bound to the substrate surface (channel wall) by covalent bonding, as suggested by Anderson. One having ordinary skill would have been motivated to do this in order to effectively immobilize the catalyst as a result of the strong adherence between the polymer in which the catalyst is incorporated and the substrate surface or spacer, thereby improving catalytic reaction conditions.

**14. Claims 3-6 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harston et al (WO 99/22857) in view of Anderson et al (US 2004/0028804) and in further view of Akiyama et al ("The Polymer Incarcerated Method for the Preparation of Highly Active Heterogeneous Palladium Catalysts").**

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15. Harston in view of Anderson is relied upon as set forth above in the rejection of claims 1 and 8.

16. Regarding claims 3-6 and 10-13, Harston in view of Anderson does not expressly disclose that the metal catalyst or metal complex catalyst is a metal or metal complex of chromium, manganese, iron, cobalt, nickel, copper, molybdenum, ruthenium, rhodium, tungsten, osmium, iridium, or palladium.

17. Akiyama teaches a method for incorporating palladium and palladium complex (Pd/C) catalysts in a polymer, which creates recoverable, reusable, and highly active heterogeneous palladium catalysts for hydrogenation, carbon-carbon, and carbon-oxygen bond forming reactions (page 3412, paragraph 1).

18. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the process as disclosed by Harston in view of Anderson by using a metal or metal complex catalyst of palladium, as suggested by Akiyama. One having ordinary skill would have been motivated to do this in order to catalyze reactions such as hydrogenation, carbon-carbon, and carbon-oxygen bond forming reactions.

***Allowable Subject Matter***

19. Claims 14 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

20. Applicant's arguments filed 11 February 2009 have been fully considered but they are not persuasive.

21. Applicant's arguments with respect to claims 1, 3-8 and 10-17 have been considered but are moot in view of the new ground(s) of rejection.

22. The Applicant argues with respect to claims 1 and 8 that Harston is silent about whether the gas passes as a gas phase at the center of the channel.

23. Examiner respectfully disagrees. Harston expressly discloses that one fluid passes down the walls of the channel, while the other fluid is maintained at the center of the channel (p. 7, lines 8-10). In the case of a gas-liquid reaction, this expressly encompasses the claimed embodiment with the gas flow in the center of the channel and the liquid flow on the walls of the channel.

***Conclusion***

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RENEE ROBINSON whose telephone number is (571)270-7371. The examiner can normally be reached on Monday through Thursday 7:30-5:00.

25. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on (571)272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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26. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. R./  
Examiner, Art Unit 1797

/Walter D. Griffin/  
Supervisory Patent Examiner,  
Art Unit 1797